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Insights on social life-cycle-assessment in practice in Sweden

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Summary

The aim of this report is to provide better understanding of opportunities for and potential limitation on social life-cycle-assessment (S-LCA) usage for decision-making and communication. We present results from and the design of an interview study on 11 major organizations in Sweden. The studied organizations were found only to a considerably limited degree to have applied S-LCA. The findings also indicate an S-LCA potential due to a considerable focus on social issues, because other approaches used by the organizations only cover short parts of product chains, and as a result of it being scientific maybe appealing to research and development units. Identified potential challenges with the methodology are; S-LCA not being holistic regarding sustainability, S-LCA users excluding indicators, S-LCA lacking context-specific indicators, the S-LCA procedure not encouraging keeping and improving suppliers and other actors, S-LCA being impractical, including costly, S-LCA results being difficult to communicate, S-LCA not providing clear risk information; and S-LCA addressing industries rather than the retailers which could exercise more pressure on product chains. The interviewees are considered to represent the organizations well. Other recent S-LCA literature only to a limited degree covers the types of findings from our study. Due to the life-cycle interest in the organizations and in Sweden in general, the findings can be of broader relevance. If a structured approach such as S-LCA is found to be needed, for example, because of the challenges with some United Nation goals and the strong relations between these issues and product chains, and the complexity of preforming it makes it very expensive there might be need for consideration of approaches to somehow handle that dilemma.

Preface

This report presents the findings from and design of an interview-based research project on social life-cycle-assessment (S-LCA) in practice. The project was running between October 2019 and March 2020. Around one month of full-time work was invested in the project by the project members. The project members are Mathias Lindkvist, PhD and Researcher at Environmental Systems Analysis (ESA), Chalmers University of Technology, and Maria Rydberg, MSc and Project manager at the Swedish Life Cycle Center. Lindkvist coordinated the identification of interviewees, carried out the interviews, wrote drafts and the final version of the report. Rydberg assisted in contacting organizations where potential interviewees could be found and provided feedback on the report drafts. The project members together analyzed the results from the interviews.

Several organizations and persons have facilitated and supported the project. We thank the foundation Adlerbertska Forskningsstiftelsen for funding the project. The interviewees, the other persons that we were in touch with, in order to search for interviewees, and the interviewees' organizations together made a rich field material available to us through the interviews. We are also indebted to the knowledge gained from and our discussions with the S-LCA researchers Henrikke Baumann and Rickard Arvidsson, both at ESA, Chalmers University of Technology.

Contents

1. Introduction

This report presents the findings from and design of a research project on using social life-cycle-assessment (S-LCA) in practice. Our intention is to provide insights that complement the focus on academic methodology-issues so far in S-LCA-research (cf., Subramanian et al. 2018). We report on our interviews with experts on the use of S-LCA and related social-sustainability approaches in 11 businesses, research institutes, and government agencies. The organizations have prominent interests in life-cycle perspectives and have a considerable part of their businesses in Sweden.

The starting point of our study is the practical difficulties to handle social sustainability resulting from product chains. The product-chain perspective – to consider that material flows connected to a product are connected to considerable impacts (cf., Hauschild et al. 2018) – is used to a notable extent by businesses (Stewart et al. 2018). In a global study on corporate sustainability reports, around 5% of the reports in recent years until 2015 were found to mention life-cycle assessment (LCA). The product-chain perspective is relevant for social sustainability because many social issues are by the United Nations (UN) considered needing a considerably better handling (cf., UN 2015). The 17 UN Sustainable Development Goals (SDGs) cover, among other, poverty, hunger, and health. Social sustainability is of importance for businesses and other organizations both as a humanitarian aspect and through the strong links to economy. Social issues along product chains are addressed by the Life Cycle Initiative's guidelines on S-LCA through publications on core guidelines (UNEP 2009) and sub-categories in the assessments (UNEP & SETAC 2013) and through current work on revising the guidelines (Life Cycle Initiative 2018). The Life Cycle Initiative is hosted by UN Environment. The presence of the S-LCA guidelines and the UN SDGs make us conclude that social issues resulting along product-chains matter and are considered not to be well-enough handled yet.

According to our knowledge, organizations and academic researchers, despite that the first version of the S-LCA guidelines were published in 2009, still know very little about practical opportunities for and limitations on using S-LCA for organizations when for example they are fully paying themselves for the assessments (cf., Baumann 2019). Organizations, including businesses, research institutes, and government agencies, and policymakers, could benefit from such knowledge because it could lower risks associated with not knowing if and if so when S-LCA could be used, and how to adapt or influence the development of S-LCA. In addition, a study of S-LCA usage in practice could guide the choice and design of academic S-LCA-research by showing what can constitute a feasible study for an organization to perform on social impacts from product chains, or conditions that could be altered in order to make such studies feasible.

The aim of this report is to spread information about use of S-LCA in practice by describing the findings from and design of an interview study with businesses and other organizations that have experience of or are likely to choose to use S-LCA. To give general orientation for the reader, Chapter 2 gives an overview of prominent tools, including guidelines, and research on S-LCA. Chapter 3 describes our study's design, consisting of how the interviews were chosen, performed, and analyzed. The results are presented in Chapter 4 and highlight opportunities for and potential limitations on S-LCA usage. A brief discussion about the study is found in Chapter 5 and covers the representativeness of the study and its relation to other overviews of S-LCA in literature. Conclusions are presented in Chapter 6.

2. On tools and case-study research on S-LCA

In order to give the reader general orientation, this chapter presents an overview on S-LCA tools and research that we have identified. The tools cover the Life Cycle Initiative guidelines (UNEP 2009), the Handbook for Product Social Impacts Assessment (PSIA) (Roundtable 2018a), and the S-LCA databases Social Hotspots Database (SHDB) (SHDB 2019) and PSILCA (Ciroth & Eisfeldt 2016).

Tools

Life Cycle Initiative

The freely available S-LCA guidelines by the Life Cycle Initiative focus on enabling complete assessment of product chains by complementing environmental LCA (E-LCA), life-cycle-costing methodologies, and working-environmental LCA (WE-LCA) with a methodology on assessment of social aspects along product chains (UNEP 2009). The guidelines consist of core guidelines published in 2009 (UNEP 2009) and additional guidance through methodological sheets published in their second version in 2013 (UNEP & SETAC 2013).

The core guidelines were developed through input from a working group at the Life Cycle Initiative, 12 organizations considered key stakeholders on social responsibility (e.g., the International Labour Office (ILO) and the World Business Council for Sustainable Development (WBCSD)), and 39 key experts (e.g., in the field of LCA). The presented assessment procedure follows that of E-LCA as far as possible and includes the phases goal and scope of the study, inventory analysis, impact assessment, and interpretation.

The methodological sheets were created by 9 authors and 10 reviewers. The authors represent, among other, universities, a sustainability consulting and software business, and UNEP. The reviewers represent, for example, universities, UNEP, and an academic LCA journal. The publication on the sheets identifies that the impact assessment in S-LCA has been made and suggested to be made either using Type 1 or Type 2 methods. Type 1 is typically using an ordinal scale, for example, from very high to low risk, but could also relate results and context. In Type 2 assessment, quantitative cause-effect models are used to reach aggregated values on the end-points human capital, cultural heritage, and human well-being. 31 sheets are presented and each of them typically contain a few hotspot indicators intended to be used for initial identification of potentially problematic product-chain locations or similar that are assessed further through 3–4 specific indicators. The sheets are found in five categories: local community (e.g., delocalization and migration), value chain actors (e.g., fair competition), consumers (e.g., health and safety), worker (e.g., freedom of association and collective bargaining), and society (e.g., public commitment to sustainability issues).

PSIA

The freely available PSIA handbook presents an assessment approach that in some ways but not in others lies close to the Life Cycle Initiative methodology (cf., Roundtable 2018a).

PSIA has been developed since 2013 by the Roundtable for Social Metrics (Roundtable n.d.). The roundtable is facilitated by PRé, which is a business focusing on services related to life-cycle-thinking (PRé n.d.), and has been developed through the input of in total around 20 businesses (e.g., BASF, Solvay, and L'Oréal) (Roundtable n.d.) and with reviews by academics (Roundtable 2018b).

PSIA focuses on assessing positive and negative social impacts of products and services (Roundtable 2018a). The approach is designed to suit E-LCA skilled employees at businesses. The procedure of PSIA is defining goal and scope, the optional formulation of developing a goal-and-scope-related strategy on circular economy, identifying hotspots, assessing impacts at the hotspots, and interpretation. For hotspot identification, the categories workers, users, local communities, and small-scale entrepreneurs are used. Around six areas are presented for each of these categories, with some areas occurring in several categories. Example areas are health, privacy, community engagement, and land rights. Within each area of each category, an approach is provided for determining an ordinal score (i.e., Type 1) with five steps from ideal performance to no data or non-compliant situation. Typically, around six indicators are used together for setting the score.

PSILCA

PSILCA is an S-LCA-database to which access can be purchased (GreenDelta 2018). The database is based on a

multi-regional input/output model from another existing database. The model claims to cover the whole world economy and the transfers between the different industrial sectors of each country. Drawing on, among other, the Life Cycle Initiative guidelines, the database uses 88 qualitative and quantitative indicators. The indicators are sorted in five categories: workers, local community, society, consumers, and value chain actors.

SHDB

SHDB is a database intended to provide easy overviews of risks and opportunities regarding social aspects in supply chains and to which access can be purchased (SHDB 2019b). Regarding the development, the database is characterized by transparency, with regards to the data coming from public sources and that these relationships are shown; is designed by scientifically skilled persons; and contains data that has been reviewed by research analysts and experts. The models included are a global input/output database, a worker-hours model that, among other, is used to identify hotspots, and social risks and opportunities data (SHDB 2019a). Themes included are guided by the Life Cycle Initiative guidelines.

Case-study research

In order to give a further overview of S-LCA, we present an outline of case-study research on S-LCA. The overview is based on Baumann (2019) and our searches in the academic-article database Scopus.

Previous overviews

We outline the findings from three earlier overviews on S-LCA case -studies (e.g., Arcese et al. 2018).

Arcese et al. (2018) identified 20 case-study articles with publication years until 2014 and published between January 2006 and November 2014. The search string used was "Social LCA and/or social LCA and/or S-LCA and/or social life cycle assessment" (Arcese et al. 2018, p. 395) applied to titles, abstracts, keywords, and conclusions in the academic-article database Science Direct. The distribution was around 1 article each year in 2006–2012 and around 7 articles each year in 2013–2014. In total, 51 either case-study or theoretical articles were found in the study, with only a small number of theoretical ones after 2012. To put the case studies in perspective, the articles overview over time can be used. The focus was found to be in publications in 2006–2008 a desire to develop the ideas presented in 1999 on providing assessment approaches to social impacts from product chains, in 2009–2011 on applying the guidelines from the Life Cycle Initiative, in 2011–2012 to test if the first version of the methodological sheets was feasible to use, and in 2013–2014 on implementation.

Petti et al. (2018) focused on S-LCA case-studies published between 2009 and May 2015 in their analysis of the S-LCA methodology. The research design utilized search strings on "Social life cycle assessment", "Social LCA", "Societal life cycle assessment", "Societal LCA", and "SLCA" combined with "case" and "study" in the academic databases Scopus, Google Scholar, and Discovery Service. The number of articles identified are 35. The distribution of time is, except for 16 articles in 2013 and an added extrapolated 14 articles in 2015, in line with the Arcese et al. (2018) study. Aspects analyzed are general characteristics such as geographical area, methodology issues such as unclear definition of the functional unit and a variety of methods for impact assessment, and a further study of how positive impacts are defined.

The number of case-studies found by Subramanian et al. (2018) and published in 2005–2016 (one in 2017) aligns with those in the two other articles. Notably, Subramanian et al.'s study includes the search string "Life cycle sustainability assessment". 53 articles on case-studies were identified.

An updated overview

In order to provide an overview of S-LCA case-studies both historically and recently, we used a search in the academic-literature database Scopus in March 2020 for articles published until 2019. The search string used was based on the presented three overview studies. We searched for the following combination:

either of
"social life cycle assessment", "social lifecycle assessment",
"social life cycle analysis", "social lifecycle analysis",
"social LCA",
"societal life cycle assessment", "societal lifecycle assessment",
"societal life cycle analysis", "societal lifecycle analysis",
"societal LCA",
"S-LCA", "SLCA",
"life cycle sustainability assessment", "lifecycle sustainability assessment",
"life cycle sustainability analysis", "lifecycle sustainability analysis", or
"LCSA"

and
"case" and "study"

The search was restricted to Scopus' categories journals, articles, and in English. Two early articles from 1981 and 1991 were excluded because they were found not to be about S-LCA. Our resulting list of articles aligned regarding number of articles per year very well with the results presented by Petti et al. (2018) and Subramanian et al. (2018). 171 articles were found. Over time, the number of articles per year were 1 in 2003 and 2005, around 3 each year in 2009–2012, 8–16 each year in 2013–2016, and 30–41 each year in 2017–2019. We looked closer at the articles published in 2019. Of the 34 articles, we found from titles and abstracts 25 to be on S-LCA case-studies, 3 to be on life-cycle-sustainability assessment (LCSA) case-studies without an explicit S-LCA component, and 6 to fall in neither of these categories. To give the reader a flavor of the recent research, a bibliographical list of the 25 articles on S-LCA case-studies is found in Table 1.

Table 1: Recent S-LCA case-study articles. Identified academic journal articles published in 2019 in English.

Cadena et al. (2019). Social life cycle assessment methodology for evaluating production process design: Biorefinery case study. *Journal of Cleaner Production*.
Corona & San Miguel (2019). Life cycle sustainability analysis applied to an innovative configuration of concentrated solar power. *International Journal of Life Cycle Assessment*.
Do Amaral et al. (2019). Sustainability assessment of sludge and biogas management in wastewater treatment plants using the LCA technique. *Revista Ambiente & Água*.
Du et al. (2019). Robust multi-criteria weighting in comparative LCA and S-LCA: A case study of sugarcane production in Brazil. *Journal of Cleaner Production*.
Du et al. (2019). Enriching the results of screening social life cycle assessment using content analysis: A case study of sugarcane in Brazil. *International Journal of Life Cycle Assessment*.
Dunmade (2019). Potential social lifecycle impact analysis of bioenergy from household and market wastes in African cities. *Agronomy Research*.
García-Sánchez & Güereca (2019). Environmental and social life cycle assessment of urban water systems: The case of Mexico City. *Science of the Total Environment*.
Heidari et al. (2019). Streamlined life cycle assessment of an innovative bio-based material in construction: A case study of a phase change material panel. *Forests*.
Karlewski et al. (2019). A practical approach for social life cycle assessment in the automotive industry. *Resources*.
Liu & Qian (2019). Evaluation of social life-cycle performance of buildings: Theoretical framework and impact assessment approach. *Journal of Cleaner Production*.
Liu & Qian (2019). Towards sustainability-oriented decision making: Model development and its validation via a comparative case study on building construction methods. *Sustainable Development*.
Mohaddes Khorassani et al. (2019). Environmental and social impact assessment of cultural heritage restoration and its application to the Uncastillo Fortress. *International Journal of Life Cycle Assessment*.
Norris et al. (2019). Creating social handprints: method and case study in the electronic computer manufacturing industry. *Resources*.
Osorio-Tejada et al. (2019). An integrated social life cycle assessment of freight transport systems. *International Journal of Life Cycle Assessment*.
Pillain et al. (2019). Social life cycle assessment framework for evaluation of potential job creation with an application in the French carbon fiber aeronautical recycling sector. *International Journal of Life Cycle Assessment*.
Santos et al. (2019). Social life cycle analysis as a tool for sustainable management of illegal waste dumping in municipal services. *Journal of Cleaner Production*.
Sawaengsak et al. (2019). Development of a social impact assessment method and application to a case study of sugarcane, sugar, and ethanol in Thailand. *International Journal of Life Cycle Assessment*.
Shi et al. (2019). A social sustainability assessment model for manufacturing company based on S-LCA." *International Journal of Sustainable Development and Planning*.
Sureau et al. (2019). Participation in S-LCA: A methodological proposal applied to Belgian alternative food chains (Part 1). *Resources*.
Tallentire et al. (2019). The challenge of incorporating animal welfare in a social life cycle assessment model of European chicken production. *International Journal of Life Cycle Assessment*.
Tsalidis & Korevaar (2019). Social life cycle assessment of brine treatment in the process industry: A consequential approach case study. *Sustainability (Switzerland)*.
Werker et al. (2019). Working conditions in hydrogen production: A social life cycle assessment. *Journal of Industrial Ecology*.
Wu et al. (2019). A social impact quantification framework for the resource extraction industry. *International Journal of Life Cycle Assessment*.
Zheng et al. (2019). Life-cycle sustainability assessment of pavement maintenance alternatives: Methodology and case study. *Journal of Cleaner Production*.
Zhou et al. (2019). Model development of sustainability assessment from a life cycle perspective: A case study on waste management systems in China. *Journal of Cleaner Production*.

3. Research design

This chapter presents the design of our interview study. Both the understanding of research design that guided the study and the study's use of methods in practice is described.

Selection of methods

Our starting point is a perspective that the world through paradigms influences the selection of methods (Arbnor & Bjerke 1994). This selection, in turn, influences where information about phenomena is studied, according to the perspective.

The paradigm used in our study is actor-network-theory (ANT) (Latour 2005). According to ANT, interactions between humans and other entities (called non-humans) together form our world. The ANT-view contrasts two views. The first view is that that reality is out there and can be exactly understood. ANT also contrasts the opposite view: that all descriptions of phenomena being entirely social constructions that humans have full power to choose as they like.

In practice, semi-structured interviews that had a considerable explorative element were used, based on Mishler's (1986) view. Mishler's view is that an interview is a dialogue where all involved parties are actively developing an understanding during the interview through the interview conversation. This was during the interviews supported by the analysis-filters of discourse analysis (Silverman 2006) and conversation analysis (Silverman 2006). Discourse analysis is based on the perspective that talk perform actions. Conversation analysis considers that there are certain limitations in which utterance that may follow another utterance when persons are having a conversation. We allowed the set up to vary between interviews because primary purposes were to create insightful descriptions and to gain the trust that could enable the interviewees later to use the findings from the study, but a certain interest in comparisons between the organizations also directed the interviews.

The analysis was directed by the overarching topics of why S-LCA has been used where applicable, why it has not been used in other cases, and in which ways S-LCA is considered or is not considered relevant onwards. From this starting point, a bottom-up perspective was applied, letting the contents of the notes, recordings, and emails from the interviews steer the selection of findings to present in this report. The mentioned analysis-filters of discourse analysis and conversation analysis were applied during the analysis too.

About the studied organizations

The study focused on organizations active in Sweden at the time of the interviews. Sweden was deliberately chosen as the focus of the study, and this is supported by Baumann (2019). The country was found to have the highest share (12%) of businesses declaring to use a life-cycle perspective in their sustainability reporting, according to a publication from 2018 (Stewart, et al., 2018). In addition, organizations in Sweden have stated an interest in S-LCA through the organization Swedish Life Cycle Center (cf., Swedish 2019).

Through the expert knowledge of among other S-LCA researcher Henrikke Baumann (per. comm. 2019), we were able to identify 13 major "organizations" that at the time of the interviews were active in Sweden and had a considerable interest in life-cycle perspectives. The term organization is here, and in the remainder of the report, used to either denote a formal organization, such as a whole business (company) or research institute, or one part of such a unit. The latter was the case for 2 of the organizations. We choose the size of the study based on that around one month of full-time work was assigned to the study. The organizations cover: 8 business organizations, labeled "BOs"; and 5 "intermediary" organizations, labeled "IOs", of research institutes and government agencies.

In total, 13 interviews with 14 interviewees in 11 of the 13 approached organizations were performed. The interviews cover 6 BOs and 5 IOs. The interviewees were at the time of the interviews in most cases working with both life-cycle approaches and social sustainability and at least with one of these. According to our assessment, each interviewee was at the time of the study, in 2019–2020, well suited to be interviewed regarding S-LCA use and related activities and

considerations for the interviewee's organization. Of the interviews, 2 were performed on site, 8 were performed through audio link (telephone, or Skype for Business or similar platform), and 3 were performed via email. The durations of the audio interviews are for the on-site ones between around 60 and 70 minutes each, for 5 of the audio-link interviews between around 30 and 40 minutes each, and for the other 3 audio-link interviews between 15 and 20 minutes each. Of the audio-based interviews, the two on-site ones were audio-recorded. The choice whether to record or not was influenced by a feeling for appropriateness and technical limitations when telephone calls were used.

We provide information about the magnitude of the studied organizations by, for confidentiality reasons, providing ranges of their number of employees globally and in Sweden. The figures are based the most recent figures that annual reports and other publicly available information from the organization's websites provided, thereby covering information from 2018–2019. For the BOs, global numbers of employees are in the range 5.000–100.000 each, numbers of employees in Sweden are at least 1.000 each, and the sums of the 6 BOs' number of employees are 100.000–300.000 globally and 30.000–70.000 in Sweden. For the IOs, the global numbers of employees are in the range 100–10.000 each and, in each of the organizations, at least 80% of the employees work in Sweden.

In order to give the reader some insight into each specific organization where one or several representatives were interviewed, we use randomly assigned designations and denote them from BO1 to BO6 and from IO1 to IO5.

4. Results: On opportunities for and potential limitations on use of S-LCA

This chapter presents results from our interview study on use of S-LCA in 11 organizations in Sweden. A presentation is made of the identified considerably limited extent to which the organizations have used S-LCA for purposes that are not solely about research publication (first sub-chapter). We then describe findings on S-LCA usage regarding opportunities for it (second sub-chapter) and potential current limitation on it (third sub-chapter). An overview of the findings, grouped per organization, is also presented (fourth sub-chapter).

On S-LCA usage this far in the organizations (BOs and IOs)

We identify that the studied organizations have used S-LCA for decision-making and communication to a considerably limited extent: BO1 and IO2 have used S-LCA, and for IO1 whether they have used S-LCA or not could not be determined. In BO1, a few S-LCA pilots had been used to test if S-LCA could be part of an existing framework for communicating environmental performance. It was found to be very difficult to use S-LCA as part of this framework, both because of difficulties to find data and to present it in a meaningful way. IO2 has used S-LCA in cooperation with businesses for the purposes of product and technology development and evaluation. The product development and technology development have involved larger businesses. Smaller businesses have been the recipients of the evaluations. The S-LCA studies involving IO2 have primarily been performed using a selection of the many social indicators available in the chosen S-LCA tools and methodologies. Their S-LCAs have been quantified with S-LCA databases and additional lack of information has been filled with national and European Union (EU) statistics. Both advantages and problems with current S-LCA methodology were presented to us. The set of indicators and S-LCA databases were considered to provide a good overview. The advantage of the overview was, however, considered to be countered by the lack of several guidelines in practice. For IO1, it was found difficult to determine whether the organization's S-LCAs had been used for decision-making or communication.

On opportunities, based on the organizations (BOs and IOs)

Through the interviews, opportunities for S-LCA usage was identified to exist through the combination of three findings (5 BOs, 3 IOs). The findings include the relevance to consider a large array of social issues. Covered by the findings are also that the long product-chains that S-LCA considers seldom have been covered within the work regarding social sustainability in the organizations. Finally, the findings contain that the scientific base of S-LCA can be attractive for product development because of the appeal of a scientific approach to an organization's research and development unit.

The relevance of social sustainability assessment is highlighted by the large array of social issues spontaneously mentioned in the interviews (5 BOs, 2 IOs). We identify from the interviews seven groups of issues and sub-groups and sub-sub-groups of these:

1. Work (4 BOs, 1 IO)
   - type of labor (3 BOs)
     - child labor (3 BOs)
     - slave labor (3 BOs)
   - wages (2 BOs, 1 IO)
     - minimum wage (1 BO)
     - low-wage jobs (1 IO)
     - wage development (1 BO)
   - equality (1 BO)
     - gender equality (1 BO)
     - diversity (1 BO)
   - employment (1 BO)
2. Local communities (1 BO)
3. Consumer privacy (1 BO)
4. Human rights (1 BO)
5. Society (1 BO)
6. Wealth distribution through additional aspects (1 BO)
   - corruption (1 BO)
   - taxes (1 BO)
7. Product-chain set-up strongly connected to social issues (4 BO, 1 IO)
   - conflict minerals (2 BOs)
   - raw materials (2 BOs)
   - critical materials (1 BO)
   - where circular economy labor occurs (1 BO, 1 IO)

BO1 was found to work with the issues of child labor, correct payment of taxes by the business, human rights, corruption, and the conflict mineral Cobalt. In addition, potential slave labor was monitored. The organization is cooperating with experts on human rights and corruption. For BO2, we were told that they, regarding social sustainability in product chains, focus on choices of materials. Other aspects considered are child labor, slave labor, where waste collection and other circular-economy activities occur, and sustainable materials. The organization has experts on critical materials. It was for BO3 said that types of risks in product chains are connected to slave labor, child labor, conflict minerals, employment, minimum wage, local communities, consumer privacy, and society. BO4 was found to monitor gender equality and diversity. In addition, the organization's wage development has been monitored. In BO6, we identified that they are developing a method around raw materials in the supply chain. Regarding IO1, social aspects related to the reuse of construction materials could be an important issue onwards. For IO3, it was said that it might become relevant for them to evaluate, among other, the textile sector because of many low-paid employees in these sectors.

The long product-chains that S-LCA considers were identified seldom to have been covered regarding social sustainability by the work in several of the studied organizations (2 BOs, 1 IO) and this observation was not countered by the findings on the other organizations. BO1 has so far when it comes to active social supply-chain work primarily been in contact with and monitored tier-one suppliers and customers and primarily upstream, because the organization has found that it can achieve the greatest influence on these actors. The organization's policy requires suppliers to check their suppliers and it is possible for the organization to test how this works through sample controls. Over time, the organization has tended to evaluate actors further upstream, and for certain purchasing actors are evaluated all the way to the raw-material source. Regarding customers, sustainability has been monitored in cases considered to pose a risk to BO1. In BO4, work has for a longer time been performed with tier one and tier two both upstream and downstream and including social sustainability. For IO4, we found that one part of the organization did not consider sustainability for product-chain actors related to the Swedish businesses working with this part of IO4 because these businesses both only to a limited degree have production outside of Sweden and are small.

A usefulness of that S-LCA is scientific was identified regarding product development (1 BO). Our study of BO2 identified that S-LCA being scientific might be an advantage regarding product development. The methodology can appeal to already scientifically oriented research and development units where product development is carried out.

On potential limitations, based on the organizations (BOs and IOs)

The interviews provided insight on different potential limitations on the current S-LCA methodology (5 BOs, 4 IOs). The limitations cover methodology components, the methodology procedure, how practical usage of S-LCA relates to current business situations, and for whom the methodology ought to be targeted.

Methodology components

Three potential types of issues were identified on components of S-LCA (2 BOs, 4 IOs). The methodology was said not to consider different holistic sustainability considerations. S-LCA was also considered too arbitrary because indicators often need and easily can be excluded in applications. Finally, the methodology was found to be non-specific, for example, regarding differences between single suppliers when it comes to these suppliers' social-sustainability performance.

The issue of not considering holistic aspects of sustainability was pointed out (1 IO). IO5 considers both environmental and social issues in a way that is aimed to result in sustainability over time. From the finding on IO5, we reflect that the combination of S-LCA, E-LCA, and life-cycle costing together covers the three commonly considered dimensions of sustainability and that this view might give the impression that sustainability is covered holistically when aspects over time and trade-offs not necessarily are handled thoroughly enough.

The arbitrariness that can result from excluding indicators in applications was found to be a potential S-LCA issue (1 IO). Results from an assessment may or may be found not to represent the social issues that an actor considers important. For IO2, it was said that the S-LCA guideline do not give guidance on which indicators to choose and that it, therefore, is up to the S-LCA practitioner to choose what is important. The exclusion of indicators was considered related to the large number of indicators in the methodology.

Non-specificity of data and methods in S-LCA was through the interviews found to be a potential issue (2 BOs, 2 IOs). The problematic aspects pointed out are the aggregation of results and that the data is not specific enough to reflect differences between situations. Our study of BO1 revealed the experience that social sustainability is considerably case specific. Social sustainability was said to depend on each supplier, country, and sector. The variation was considered making it difficult to know what is being assessed and what one aggregated quantitative figure

means. The consequence of ambiguous results was said to be difficulties to avoid social window-dressing when the current S-LCA methodology is used. For BO2, the biggest current S-LCA problem was considered the difficulty of comparing different impact categories to one another. For a larger IO1 project planned to run shortly, the project leader was already expecting that great flexibility should be used when defining which sustainability issues to target together with the clients of the project. From our study of IO2, it was mentioned that a limitation of the current S-LCA methodology can be that it is a general approach that is based on industrial sectors and countries but not on specific companies.

Methodology procedure

The procedure of S-LCA methodology and tools was found to be a potential issue due to a lack of focus on continuous improvement at an upstream or downstream actor (1 BO, 1 IO). BO1 uses different methods to work with existing suppliers regarding social issues. The methods consist of dialogue, raising the level of awareness of problems, showing that BO1 is engaged in the issues, using time plans, and sometimes through contracts. IO3 has considered that a move of an activity to Europe can be problematic. Other actors have made the organization aware of that a potential move of recycling to Europe could be disadvantageous due to harm caused to the local labor-markets from which the activities are moved.

How

How practical usage of S-LCA relates to current business situations can be an issue because of S-LCA being impractical, opaque, and unfocused (5 BOs, 4 IOs).

S-LCA impracticality was identified regarding being costly, difficult to perform and to commission, time consuming, and not yet fully ready for use (4 BOs, 4 IOs). From the BO1 testing of S-LCA, the conclusions were made regarding both data collection and follow-up. It was difficult to get data both internally and from suppliers despite that the latter ones were very helpful. The data gathering becomes particularly important due both to the experienced need for follow-ups as a result of that social-performance changes can occur quickly, and to the difficulties and related costs of measuring social performance. At BO2, a reflection was made that S-LCA might require a large effort initially, thus preventing organizations from trying to use the methodology. From the BO3 study, we found that PSIA both is considered potentially to be too time consuming in the modeling part and to be an interesting option. BO4 has seen assessment of social sustainability as resource intense. Businesses were experienced to be used to monitoring environmental but not social performance. The IO1 study revealed that S-LCA might not been enough developed yet. At IO2 it had been found that many businesses have difficulties using the current S-LCA methodology because it requires the competence and time for conducting and analyzing the results of an S-LCA. The difficulty is related to the methodology being relatively complex and that a certain amount of time therefore is needed before results can be implemented within the business and the value chain. For IO3, it has been argued that demanding case studies for generalizing data is needed before the organization potentially can work with using S-LCA for industry. At IO5 it had been observed that businesses and procurers not have had the resources for, among other, commissioning LCA and specifying how to perform a sustainability analysis. The lack of resources warranted in general less complicated methods within sustainability.

Opaqueness was identified regarding the difficulty of communicating S-LCA results (1 BO, 1 IO). At BO1, the experience revealed was that it was very difficult to integrate S-LCA into an existing framework for communication. For IO2, the opinion was that it is difficult to present S-LCA results, both when the presentations are carried out by IO2 and when the presentations are performed by businesses.

S-LCA being unfocused could be an issue due to interest by the organizations in clear risk-based approaches (4 BOs). Prominent S-LCA tools use hotspots identification as one step but the interviews point to a potential usefulness of further clarity and simplicity in risk management of social product-chain issues. BO1 was found to work both with the concept of high-risk countries and with, in some cases, the consideration of high-risk customers. At BO2, the purchasing department was identified to risk evaluate new potential suppliers. BO3 was considering laws and regulations disincentivizing use of minerals from a specific country. It was revealed that BO6 is developing a sustainability system with a strong focus on risk assessing subcontractors.

For whom

For whom the methodology ought to be targeted was identified as a potential effectiveness issue with current S-LCA focus (1 IO). In our IO2 study, it was pointed out that S-LCA can be particularly relevant for retailers because these can use S-LCA-results to put demands on the business, suppliers, and the value chain. A retailer focus was contrasted to a considerable current targeting of industry.

Overview of the findings

Table 2 provides an outline of the findings from the previous parts of this chapter on S-LCA usage and on opportunities and potential limitations related to S-LCA usage.

Table 2: Findings from the organizations – businesses BO1 to BO6 and "intermediaries" IO1 to IO5*

Aspect	BO1	BO2	BO3	BO4	BO5	BO6	IO1	IO2	IO3	IO4	IO5
Use	Yes	–	–	–	–	–	?	Yes	–	–	–
Input on usage opportunities											
Relevant	Yes	Yes	Yes	Yes	–	Yes	Yes	–	Yes	–	–
Long chains	Yes	–	–	Yes	–	–	–	–	–	Yes	–
Scientific	–	Yes	–	–	–	–	–	–	–	–	–
Input on potential usage limitation											
Non-holistic	–	–	–	–	–	–	–	–	–	–	Yes
Arbitrary	–	–	–	–	–	–	–	Yes	–	–	–
Non-specific	Yes	Yes	–	–	–	–	Yes	Yes	–	–	–
Discontinuing	Yes	–	–	–	–	–	–	–	Yes	–	–
Impractical	Yes	Yes	Yes	Yes	–	–	Yes	Yes	Yes	–	Yes
Opaque	Yes	–	–	–	–	–	–	Yes	–	–	–
Unfocused	Yes	Yes	Yes	–	–	Yes	–	–	–	–	–
Non-effective	–	–	–	–	–	–	–	Yes	–	–	–

* A minus sign denotes a "No"

5. Discussion

We provide a brief discussion on both the study's representativeness, and the study's relation to other overviews of S-LCA in literature.

On the design of the study

We outline reasoning about the relevance of the design of the study regarding both representativeness within each organization and additional generalizability.

Were representative persons interviewed? Finding relevant interviewees that could describe major parts of the organizations' relation to S-LCA seemed to go rather well. Because the organizations are large in many cases, this indicates that a strong network culture exists that encompasses staff working on life-cycle approaches and social sustainability.

Additional generalizability is considered based on a combination of the representativeness within each organization and the number of organizations studied. The number of organizations included in the interviews is 11. Our selection of organizations is based on the study being limited to around one month of full-time work. The resource limitation is countered by three aspects. Advantageous to the study is it being informed by S-LCA-research experts, performed on organizations in a country (Sweden) where life-cycle approaches are comparably prominent, and the study running at around 20% of full and, thus, allowing for the time typically needed from searching for interviewees to presenting results from an analysis. Weighed together, we conclude that the study, before relating it to other research, can have relevance regarding insights on decision-making and communication based on S-LCA and related approaches.

A *comparison with literature on S-LCA*

We compare the scope of our study on S-LCA usage to the by us identified overview studies on S-LCA recently. The studies consist both of four studies with limited scope-overlap with our research (e.g., Arcese et al. 2018) and a study on S-LCA in relation to decision-making (Subramanian et al. 2018). Arcese et al. (2018) provided an overview of the different ways that research has developed S-LCA. Iofrida et al. (2018) concluded that S-LCA development is struggling because it has paid too little attention to how to choose both theoretical bases and epistemology. Luchetti et al. (2018) found increasing amounts of case studies on S-LCA and integration of S-LCA and E-LCA. Petti et al. (2018) analyzed S-LCA publications regarding general characteristics such as geographical area, methodology issues such as unclear definition of the functional unit and a variety of methods for impact assessment, and in further detail how positive impacts are defined. Subramanian et al. (2018) considered decision-making and S-LCA through S-LCA publications on case studies, theoretical approaches, and reviews. Challenges found in the study on S-LCA are the following eight: not covering all stakeholder types, too few positive impacts, limited attention to suppliers and consumers, subjective indicators, limited attention to contextual indicators, limited focus on indirect indicators, too little documentation linking indicators to a product, and lack of benchmarks. Of the eight aspects, an overlap with our findings exist for limited attention to suppliers and consumers, and limited attention to contextual indicators. The findings in our study cover ten aspects not focused on in Subramanian et al.'s study. Further details are also provided for the twelve aspects indicated in our study. The limited overlap between the two studies could be explained by one analyzing existing publications and the other using interview material with organizations who has expressed interest in and in some cases used S-LCA in practice.

6. Conclusion

The aim of this report is to provide better understanding of opportunities for and potential limitation on S-LCA usage for decision-making and communication. We present results from and the design of an interview study on 11 major organizations in Sweden. The studied organizations were found only to a considerably limited degree to have applied S-LCA. The findings also indicate an S-LCA potential due to a considerable focus on social issues, because other approaches used by the organizations only cover short parts of product chains, and as a result of it being scientific maybe appealing to research and development units. Identified potential challenges with the methodology are S-LCA not being holistic regarding sustainability, S-LCA users excluding indicators, S-LCA lacking context-specific indicators; the S-LCA procedure not encouraging keeping and improving suppliers and other actors; S-LCA being impractical, including costly, S-LCA results being difficult to communicate, S-LCA not providing clear risk information; and S-LCA addressing industries rather than the retailers which could exercise more pressure on product chains. The interviewees are considered to represent the organizations well. Other recent S-LCA literature only to a limited degree covers the types of findings from our study. Due to the life-cycle interest in the organizations and in Sweden in general, the findings can be of broader relevance. If a structured approach such as S-LCA is found to be needed (for example, because of the challenges with for example some United Nation goals and strong relations between these issues and product chains) and the complexity of preforming it makes it very expensive, maybe consideration of a wide variety of approaches to somehow handle that dilemma might be needed.

References

Arbnor, I. & B. Bjerke (1994). *Företagsekonomisk metodlära* [Methodology for business administration]. Studentlitteratur.

Arcese, G, M. C. Lucchetti, I. Massa, & C. Valente (2018). State of the art in S-LCA: Integrating literature review and automatic text analysis. *International Journal of Life Cycle Assessment* 23, 394–405. https://doi.org/10.1007/s11367-016-1082-0.

Baumann, H. (2019). *Social livscykelanalys: Erfarenheter hos svenska användare* [Social life cycle assessment: Swedish users' experience]. Grant application submitted to the foundation Adlerbertska Forskningsstiftelsen, Mölndal, Sweden, in 2019.

Ciroth, A. & F. Eisfeldt (2016). *PSILCA – A Product Social Impact Life Cycle Assessment database: Database version 1.0: Documentation: Version 1.1. GreenDelta*.

GreenDelta (2018). *PSILCA*. Accessed on 20 March 2020 from https://psilca.net/.

Hauschild, M. Z., R. K. Rosenbaum, & S. I. Olsen (Eds.) (2018). *Life cycle assessment: Theory and practice*. Cham, Switzerland: Springer.

Iofrida, N., A. Strano, G. Gulisano, & A. I. De Luca (2018). Why social life cycle assessment is struggling in development? *International Journal of Life Cycle Assessment* 23, 201–203. https://doi.org/10.1007/s11367-017-1381-0.

Latour, B. (2005). Reassembling the social: An introduction to actor-network-theory. Oxford: Oxford University Press.

Life Cycle Initiative (2018). *Guidelines for Social Life Cycle Assessment (S-LCA)*. Accessed on 19 March 2020 from https://www.lifecycleinitiative.org/activities/key-programme-areas/life-cycle-knowledge-consensus-and-platform/guidelines-for-social-life-cycle-assessment-solca/.

Lucchetti, M. C., G. Arcese, M. Traverso, & C. Montauti (2018). S-LCA applications: a case studies analysis. *E3S Web of Conferences* 74, 10009. https://doi.org/10.1051/e3sconf/20187410009.

Mishler, E. G. (1986). *Research interviewing: Context and narrative*. Cambridge, MA: Harvard University Press.

Petti, L., M. Serreli, & S. Di Cesare (2018). Systematic literature review in social life cycle assessment. *International Journal of Life Cycle Assessment* 23, 422–431. https://doi.org/10.1007/s11367-016-1135-4.

PRé (n.d.). *About PRé*. Accessed on 20 March 2020 from https://www.pre-sustainability.com/about-pre.

Roundtable for Product Social Metrics (n.d.). *About us*. Accessed on 20 March 2020 from https://product-social-impact-assessment.com/about-us/.

Roundtable for Product Social Metrics (2018a). *Handbook-2018: Version 4.0 – September 2018*. Amersfoort, the Netherlands: PRé Sustainability.

Roundtable for Product Social Metrics (2018b). *Methodology Report 2018: Version 1.0 – September 2018*. Amersfoort, the Netherlands: PRé Sustainability.

SHDB (Social Hotspots Database) (2019a). *For more information*. Accessed on 20 March 2020 from https://www.socialhotspot.org/for-more-information.html.

SHDB (2019b). *Tools*. Accessed on 20 March 2020 from https://www.socialhotspot.org/tools.html.

Silverman, D. (2006). Interpreting qualitative data: Third edition. London: SAGE.

Stewart, R., P. Fantke, A. Bjørn, M. Owsianiak, C. Molin, M. Z. Hauschild, & A. Laurent (2018). Life cycle assessment in corporate sustainability reporting: Global, regional, sectoral, and company-level trends. *Business Strategy and the Environment* 27, 1751–1764. https://doi.org/10.1002/bse.2241.

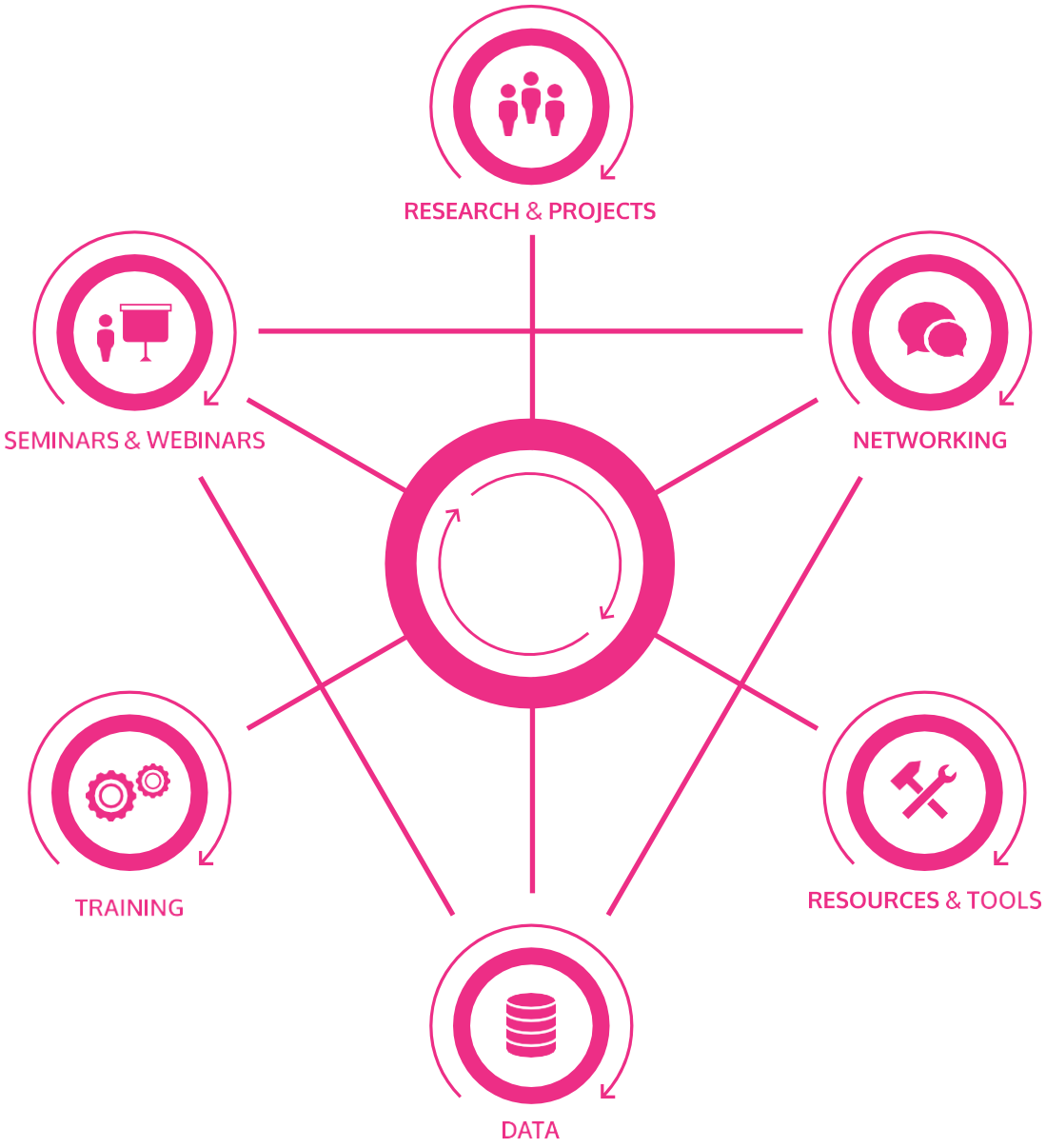
Subramanian, K., C. K. Chau, & W. K. C. Yung (2018). Relevance and feasibility of the existing social LCA methods and case studies from a decision-making perspective. *Journal of Cleaner Production* 171, 690–703. https://doi.org/10.1016/j.jclepro.2017.10.006.

Swedish Life Cycle Center (2019). *Social LCA*. Accessed on 26 November 2019 from https://www.lifecyclecenter.se/projects/social-lca/.

UN (United Nations) (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. Resolution adopted by the General Assembly on 25 September 2015, A/RES/70/1.

UNEP (United Nations Environment Programme) (2009). Guidelines for social life cycle assessment of products.

UNEP & SETAC (Society of Environmental Toxicology and Chemistry) (2013). *The methodological sheets for sub-categories in social life cycle assessment (S-LCA)*. Accessed on 19 March 2020 from https://www.lifecycleinitiative.org/wp-content/uploads/2013/11/S-LCA_methodological_sheets_11.11.13.pdf.



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